

CLAIMS

1 1. A method for performing an input/output operation to a storage device from a
2 computer, the storage device having one or more data paths to the computer, the method
3 comprising the steps of:

4 selecting a first data path from a set of data paths to the storage device;
5 attempting the input/output operation using the selected first data path;
6 selecting, in response to an error in the input/output operation using the first data
7 path, a next data path from the linked list of data paths; and
8 attempting the input/output operation using the selected next data path.

1 2. The method of claim 1 wherein the set of data paths is dynamically generated in
2 response to storage device events.

1 3. The method of claim 2 wherein the storage device event further comprises a Fibre
2 Channel loop initialization event.

1 4. The method of claim 1 wherein the first data path further comprises a last used
2 data path associated with the storage device.

1 5. The method of claim 1 wherein the storage device further comprises a disk drive.

1 6. The method of claim 5 wherein the disk drive is operatively interconnected with
2 the computer by a Fibre Channel Arbitrated Loop.

1 7. The method of claim 1 wherein the computer further comprises a file server.

1 8. The method of claim 1 wherein the set of data paths are described by a related set
2 of data structures.

1 9. The method of claim 1 wherein the data paths utilize a Fibre Channel connection.

1 10. A method for maintaining a set of data paths accessible by a set of upper level
2 services of a storage operating system of a computer, the method comprising the steps of:
3 creating a device instance associated with a storage device;
4 creating a first path instance associated with a first path to the storage device;
5 creating, in response to events identifying an addition of a path, an additional path
6 instance associated with an additional path to the storage device; and
7 deleting, in response to events identifying a removal of a path, a path instance as-
8 sociated with the removed path.

1 11. The method of claim 10 wherein the step of creating a device instance occurs in
2 response to receipt of an event identifying an addition of a storage device.

1 12. The method of claim 10 wherein the events identifying an addition of a path is a
2 Fibre Channel loop initialization event.

1 13. The method of claim 10 wherein the events identifying removal of a path is a Fi-
2 bre Channel loop initialization event.

1 14. The method of claim 10 wherein the step of creating an additional path instance
2 further comprises the step of linking the additional path instance to a linked list of path
3 instances associated with the storage device.

1 15. The method of claim 10 wherein the device instance and path instances are acces-
2 sible via an application program interface.

1 16. The method of claim 10 wherein the set of upper level services further comprises
2 a redundant array of inexpensive disks layer of the storage operating system.

1 17. A computer for use with a plurality of storage devices having one or more data
2 paths associated with the storage devices, the computer comprising:
3 means for detecting changes to the data paths associated with the storage devices;

4 means for maintaining a set of path instances associated with each of the plurality
5 of storage devices, the data path instances accessible to a set of upper level services;
6 means for performing input/output operations to the plurality of storage devices
7 using a first data path;
8 means for selecting alternate data paths, in response to an error occurring with the
9 first data path; and
10 means for performing input/output operations to the plurality of storage devices
11 using the selected alternate data paths.

1 18. The computer of claim 17 wherein the upper level services access the data path
2 instances via an application program interface.

1 19. A storage operating system executing on a computer, the storage operating system
2 comprising:
3 a routing administration layer, the routing administration layer dynamically up-
4 dating a set of device instances, each device instance associated with a storage device;
5 wherein each device instance includes at least one path instance, each path in-
6 stance identifying a path from the computer to the associated storage device; and
7 a set of upper level services, the upper level services capable of accessing the de-
8 vice instances.

1 20. The storage operating system of claim 19 wherein the routing administration layer
2 further comprises an application program interface, the application program interface
3 providing the upper level services access to the set of device instances.

1 21. The storage operating system of claim 19 wherein the upper level services further
2 comprises a redundant array of independent disks layer of the storage operating system.

1 22. A computer-readable medium, including program instructions executing on a
2 computer, for performing an input/output operation to a storage device having one or
3 more data paths to the computer, the program instructions including steps for:

4 selecting a first data path from a linked list of data paths to the storage device;
5 attempting the input/output operation using the selected first data path;
6 selecting, in response to an error in the input/output operation using the first data
7 path, a next data path from the linked list of data paths; and
8 attempting the input/output operation using the selected next data path.

1 23. A computer-readable medium, including program instructions executing on a
2 computer, for maintaining a set of data paths accessible by a set of upper level services of
3 a storage operating system, the program instructions including steps for:
4 creating a device instance associated with a storage device;
5 creating a first path instance associated with a first path to the storage device;
6 creating, in response to events identifying an addition of a path, an additional path
7 instance associated with additional path to the storage device; and
8 deleting, in response to events identifying a removal of a path, a path instance associated
9 with the removed path.